PROBLEMS ASSOCIATED WITH THE VALUE-RELEVANCE OF FINANCIAL DERIVATIVES ACCORDING TO IAS 39

SSE/EFI WORKING PAPER SERIES IN BUSINESS ADMINISTRATION

NO 2003:2

BEATE JUETTNER-NAUROTH[1]

August 2004

University of Applied Sciences of the Deutsche Bundesbank

Schloss Hachenburg

D-57627 Hachenburg, Germany

Phone: +49 2662 83-1

E-mail: dr.juettner@fh-bundesbank.de (Correspondence address)

Stockholm School of Economics

Box 6501

SE-11383 Stockholm, Sweden

[1] I wish to thank Jochen Beißer, Holger Kraft, Stephan Ryan and Kenth Skogsvik. The paper represents my personal opinion and does not necessarily reflect the views of the Deutsche Bundesbank.

PROBLEMS ASSOCIATED WITH THE VALUE-RELEVANCE OF THE FAIR VALUE OF FINANCIAL DERIVATIVES ACCORDING TO IAS 39

This paper studies some fundamental issues concerning the relation between the market value of equity and the fair value of financial derivatives determined according to International Accounting Standard No. 39, "Financial Instruments: Recognition and Measurement" (IAS 39) in non-active markets. It is shown for an example that the fair value of a financial derivative determined by a valuation model is not relevant in a non-active market. It is also demonstrated that in a setting of a non-active market, determining the fair value under the fiction of an active market does not take all available information into account. In this case it is noted that the definition of fair value according to IAS 39 has two consequences:

(i) The market value of equity at the balance sheet date reflects the company's value in a fictive market situation.

(ii) The fair value calculated by one valuation model is in general not unique.

1. INTRODUCTION

The International Accounting Standard (IAS) 39 requires that all financial derivatives in principle are measured at their fair value subsequent to initial recognition. Additionally the previous (i.e., 'Exposure Draft of Proposed Amendments to IAS 39 Financial Instruments: Recognition and Measurement', 'Draft Standard and Basis for Conclusions'; 'Accounting for Financial Assets and Financial Liabilities') discussion documents of the International Accounting Standards Board (IASB) address measurement issues relating to fair value accounting.

The measurement of financial derivatives at fair value is a controversial issue. The Financial Instruments Joint Working Group of standard setters (JWG) proclaims in its ‘Draft Standard and Basis for Conclusions Financial Instruments and Similar Items’ that the fair value is the “most relevant measurement attribute for all financial instruments”. Contrary to the JWG many comment letters on the discussion paper, ‘Accounting for Financial Assets and Financial Liabilities’ call into question the benefits of fair value accounting for financial instruments. Furthermore empirical studies (e.g., Venkatachalam (1996), Simko (1999)) test the usefulness of the disclosure of fair values for financial derivatives. Venkatachalam (1996) concludes that such disclosures generally have an information content in addition to historical cost-accounting values, whereas Simko's findings are contradictory to this result.

Both Simko and Venkatachalam deal with the problem of fair value accounting for financial derivatives from an empirical perspective. The purpose of this paper is to address the usefulness of measuring financial derivatives at fair value from a theoretical point of view. In particular the following questions are addressed:

- How is the fair value of financial instruments related to the firm value?
- Which values of financial assets and financial liabilities reflect the firm value?
- Is the fair value unique? Is there any discretion left to the management given the fact that everybody uses the same valuation model?

In compliance with the Committee on Accounting and Auditing Measurement 1989-1990 and Barth & Landsman (1995) a financial statement item is defined to be value-relevant if it reflects the firm value. The analysis presumes that the balance sheet contains all necessary information in assessing the firm value. This means that the recognized assets and liabilities generate all future cash flows of the company. In addition everybody has the same information. The following analysis hinges on a model of a non-active market. First, the relevant values are derived in this setting. Second, the fair value is compared to the relevant values. The comparison is made between the fair value of a share option - being an example for a financial derivative - and the relevant values of the option.

The major results are as follows: (1) the fair value determined by a valuation model is not necessarily value-relevant in a non-active market. (2) In a non-active market the determination of fair value under the fiction of an active market has the inherent deficiency that not all available information is taken into account. This has two consequences: First, the firm value reflects the company's value from the point of view of a fictitious market participant in a market situation that does not exist at the balance sheet date.

Second, the company has flexibility in determining the fair value, as it can select the information, which underlies the valuation model.

The remainder of the paper is organized as follows: The following section defines the fair value of a financial derivative according to IAS 39. Section three reviews the related literature. Section four deals with the concept of value relevance in active and non-active markets. Section five provides concluding remarks.

2. DEFINITION OF FAIR VALUE ACCORDING TO IAS 39

Since 1988 the International Accounting Standards Committee (IASC) and the IASB has worked on a standard, which deals with the accounting for financial instruments.

IAS 39 *Financial Instruments: Recognition and Measurement* was issued in December 2003 and deals with accounting rules for financial instruments. Effective for fiscal years beginning at the earliest on January 1, 2005, IAS 39 requires firms to recognize the fair value of basically all financial derivatives held for trading after initial recognition.[1] Fair value is defined as "the amount for which an asset could be exchanged, or a liability settled between knowledgeable, willing parties in an arm's length transaction"[2].[3]

IAS 39 provides a general, rather than detailed, guidance on the specification of fair values. If a market price exists in an active market, the fair value is normally the market price.[4] Otherwise the fair value is determined according to some valuation model.[5]

The term "active market" remains undetermined, although IAS 39 AG71. provide a definition:[6] "A financial instrument is regarded as quoted in an active market if quoted prices are readily and regularly available from an exchange, dealer, broker, industry group, pricing service or regulatory agency, and those prices represent actual and regularly occurring market transactions on an arm's length basis."

The questions remains which are the necessary and/or sufficient market conditions to ensure that "prices represent actual and regularly occurring market transactions on an arm's length transaction". The description of an "active market" as in IAS 39 AG71. is therefore not helpful in defining an active market.[7] Barth & Landsman (1995) equate actively traded markets with markets being free of arbitrage and complete. Future uncertainty can be described as a set of future possible states of nature. A state security is defined as a security that has a return of *$1* in one state of nature and nothing in all other possible states. According to Barth & Landsman (1995) a complete market is characterized by the existence of a unique state price for every state security; consequently every asset and every liability has a unique value. By contrast in an incomplete market the state price is not unique in general. In the following analysis an "active" market is defined according to Barth/Landsman.

Figure 1 summarizes the general determination of the fair value of a financial derivative (e.g. a share option) according to IAS 39.

[INSERT FIGURE 1]

3. LITERATURE REVIEW

According to the Committee on Accounting and Auditing Measurement and Barth & Landsman (1995), the value of an asset/liability is defined as relevant if it allows the shareholder to assess the market value of equity.

The studies mentioned in figure 2 test empirically the value-relevance of the fair value of financial instruments.[8] They are all related to the US- market and generally hinge upon the fair value definition according to a Statement of Financial Accounting Standards (SFAS).[9]

[INSERT FIGURE 2]

Starting point of the derivation of the regression equation is an ideal setting:

- The market is free of arbitrage and complete; i.e. every asset $i\ (i = 1,2,\ldots m)$ and every liability $j\ (j = 1,2,\ldots,n)$ has a unique value MVA_i and MVL_j, respectively.
- There is complete information on the balance sheet; i.e. the assets and liabilities recognized on the balance sheet generate the future cash flows of the company. No synergy effects exist between assets.

As the assets and liabilities recognized on the balance sheet generate all future cash flows of the firm, in arbitrage-free markets the market value of equity MVE is equal to the market values of all assets minus the market values of all liabilities.

Thus, in a setting of a perfect and complete market the following equation holds:

$$MVE(t) = \sum_{i=1}^{m} MVA_i(t) - \sum_{j=1}^{n} MVL_j(t) \tag{1}$$

Equation (1) shows that the market value for every asset and every liability is value-relevant. Consequently, if the fair value is defined as market value in active markets, then the fair value is value-relevant.

After subtracting the identity:

$$BVE(t) \equiv \sum_{i=1}^{m} BVA_i(t) - \sum_{j=1}^{n} BVL_j(t) \tag{2}$$

from the equation (1) one gets:

$$MVE(t) - BVE(t) = \sum_{i=1}^{m} \left[MVA_i(t) - BVA_i(t)\right] - \sum_{j=1}^{n} \left[MVL_j(t) - BVL_j(t)\right] \tag{3}$$

where $BVE\ (t)$, $BVA_i(t)$ and $BVL_j(t)$ designate the book value of equity, the book value of asset *i* and the book value of liability *j* at balance sheet date *t*, respectively.

Two possible deviations of this ideal case are considered:

- The balance sheet does not contain all relevant information.

  If the balance sheet does not contain all relevant information, equation (1) does not hold. The equation has to be adjusted by adding some constant b_0, representing the present value of future cash flows expected to be generated by assets, liabilities or other "economic values" of the company (such as for instance brand names) which are not recognized.

- The market is free of arbitrage, but the fair value is not correctly determined. The equality

  $$MVE(t) - BVE(t) = \sum_{i=1}^{m} \left[FVA_i(t) - BVA_i(t)\right] - \sum_{j=1}^{n} \left[FVL_j(t) - BVL_j(t)\right] \tag{4}$$

  does not hold in the presence of measurement errors. FVA_i and FVL_j denote the fair value of an asset *i* and liability *j*. Measurement errors are captured by an adjustment factor b_i for asset *i* and an adjustment factor c_j for liability *j*. By taking both discrepancies of the ideal case into account, equation (4) transforms to:

$$MVE(t) - BVE(t) = \sum_{i=1}^{m} b_i \left[FVA_i(t) - BVA_i(t)\right] - \sum_{j=1}^{n} c_j \left[FVL_j(t) - BVL_j(t)\right] + b_o \quad (5)$$

Equation (5) is the regression equation, which is generally used in the empirical studies.[10] Holthausen & Watts (2001, p. 18) point out that it is necessary for all the studies to assume that the capital markets are “reasonably efficient”. Otherwise the results of the value-relevance studies that the fair values of certain balance sheet positions are relevant or not would be a useful benchmark for standard setting.

The empirical studies typically proceed in two steps: First, the coefficients b_i and c_j are determined. Second, the relevance of the fair value is tested. A fair value is seen as relevant, if the coefficient b_i respectively c_j are significantly positive. It is seen from table 2 that the results of the empirical studies are not consistent (e.g. Barth, Beaver and Landsman (1996) found out that the fair values of loans are value-relevant in 1993, whereas Eccher, Ramesh and Thiagarajan (1996) conclude, that the fair values of loans are not value-relevant in1993).

Barth and Landsman (1995) deal with fair value accounting in general and from a theoretical perspective. In active markets the fair value is well-defined and value-relevant. They state that the fair values are not unambiguously unique in non-active markets; i.e. entry and exit values and value-in-use are not necessarily equal. Implementation of fair value accounting requires that standard setters select one from these value constructs. Barth and Landsman conclude that the value-in-use is the relevant value in incomplete markets in general.[11]

Concerning the relevance of the fair value of a financial derivative, the results of Simko’s empirical study do not correspond to Venkatachalam’s results. Therefore this paper analyses the relationship between the market value of equity and the fair value of a financial derivative from a theoretical perspective. However, my approach differs from the study of Barth and Landsman (1995). Whereas Barth and Landsman (1995) discuss possible fair value definitions (entry value, exit value and value-in-use) for an incomplete market, my analysis sticks to the fair value definition used in IAS 39.

4. VALUE-RELEVANCE

4.1 VALUE-RELEVANCE IN A COMPLETE MARKET

It is generally known (e.g. Barth & Landsman (1995), Beaver (1998)) that the market value of an asset or a liability is the relevant value in a market free of arbitrage and complete. Equation (1) holds in a complete market; the market value of every asset and every liability is unique. According to IAS 39 the fair value is the market value in active markets and therefore the fair value is relevant in active markets.

4.2 VALUE-RELEVANCE IN AN INCOMPLETE MARKET

4.2.1 RELEVANT VALUES IN AN INCOMPLETE MARKET

In this section the analysis hinges upon two assumptions. First, it is presumed that there is complete information on the balance sheet. This means that the assets and liabilities recognized on the balance sheet generate the future cash flows of the company. No synergy effects exist between assets. Second, the market is incomplete, i.e. the market is free of arbitrage and no unique market value exists for at least one state security.

Two scenarios are now considered. *In the first scenario it is assumed that at t=0 a price exists for every asset* $MPA_i(0), \quad i = 1,\ldots,m$ *and every liability* $MPL_j(0), \quad j = 1,\ldots,n$ of the firm. Completeness of information on the balance sheet and the existence of market prices, yield the following market value of equity (*MVE*) of a company at the balance sheet date *t=0*:

$$MVE(0) = \sum_{i=1}^{m} MPA_i(0) - \sum_{j=1}^{n} MPL_j(0) \qquad (6)$$

According to equation (6), the relevant value of an asset is its market price.

In the second scenario it is assumed that no market price exists for at least one of the firm's assets or liabilities. Without loss of generality it is assumed that there does not exist a market price for any of the firm's assets and liabilities. At the balance sheet date *t=0* the set of market values of asset *i* and liability *j* is the range between an upper bound $MVA_i^{ub}(0)$ and $MVL_j^{ub}(0)$ and a lower bound $MVA_i^{lb}(0)$ and $MVL_j^{lb}(0)$:

$$\text{Set of market values of asset} \quad i = \left]MVA_i^{lb}(0), MVA_i^{ub}(0)\right[\tag{7}$$

$$\text{Set of market values of liability} \quad j = \left]MVL_j^{lb}(0), MVL_j^{ub}(0)\right[\tag{8}$$

Completeness of information on the balance sheet and the existence of valuation bounds for assets and liabilities lead to the following set of market values of equity:

$$\text{Set of market values of equity} = \left]MVE^{lb}(0), MVE^{ub}(0)\right[\tag{9}$$

The lower bound of the market value of equity is:

$$MVE^{lb}(0) = \sum_{i=1}^{m} MVA_i^{lb}(0) - \sum_{j=1}^{n} MVL_j^{ub}(0)$$

and the upper bound of the market value of equity is:

$$MVE^{ub}(0) = \sum_{i=1}^{m} MVA_i^{ub}(0) - \sum_{j=1}^{n} MVL_j^{lb}(0)$$

In this simple setting, the values of the assets and liabilities which inform about the range of the possible market values of equity (9) are value-relevant. Every value in the range of the possible market values of equity fulfils the requirement of no arbitrage. This means, a risk-free gain cannot be achieved by either selling the company and reconstructing a similar company (i.e., the assets are bought and the liabilities are incurred which generate the set of cash flow patterns of the sold company), or by buying the company and selling the set of possible cash flow patterns of the company. The range of market values of an asset (7) and the range of market values of a liability (8) explain the set of possible market values of equity and are thus value-relevant.

4.2.2 FAIR VALUE-RELEVANCE

In this section the assumptions of the previous section hold. Again, it is assumed that the balance sheet contains all assets and liabilities. Additionally, it is assumed that there is no information asymmetry and the market is incomplete. Incompleteness is modelled according to the previous section in such a way that the relevant values of the option are the range between an upper bound $MVA^{ub}(0)$ and a lower bound $MVA^{lb}(0)$:

Assumption 1 ***(Existence of a share and a risk free bond)*** *A share and a risk free bond are traded. The risk free bond has a nominal value of one; it yields the risk free rate r as interest and is paid back after one period. The actual stock price at t=0 is S(0) and there are three possible share prices at the following date t=1: Thus the parameters u, v and d (with u > R(≡ 1+r) > d > 0 and u > v > d) describe the stock price dynamics.*

According to IAS 39, a valuation model is supposed to be used to determine the fair value of a stock-option in a non-active markets. According to IAS 39 AG74. the fair value is determined by reference to the stock option's market price of the recent market transaction or by reference to current fair values for similar financial instruments or by using discounted cash flow analysis or option pricing models. Both IAS 39 and the 'Exposure Draft of Proposed Amendments to IAS 39: Financial Instruments: Recognition and Measurement' do not specify the types of option pricing models which should be used in a non-active market; it is merely emphasized that these models are well established. In the Discussion Paper[12] "Accounting for Financial Assets and Financial Liabilities" two models are mentioned for the calculation of the value of a share option: the binomial model and the Black-Scholes model. As the formula to value a European stock option in the "binomial world" converges towards the Black-Scholes formula (see Cox, Ross & Rubinstein (1979)) only the binomial model is used in this study. The calculation of a stock option's market value according to the binomial model is illustrated in the following.

In a market, which is free of arbitrage, the price of an asset is the present value of the future returns of the asset (see e.g. Varian (1991)), where the discount factors are the state prices. In a binomial world two state prices exist: $\pi_{1,0}$ and $\pi_{0,1}$. The state price $\pi_{1,0}$ ($\pi_{0,1}$) is the price of a state security which yields *$1* (*$0*) in the up-state and *$0* (*$1*) in the down-state. Under the assumption of no arbitrage the state price lies between two bounds: *$0* and *$1*.[13] The stock price at *t=0* is *S(0),* and at the following date *t=1* it is hence either $u \cdot S(0)$ or $d \cdot S(0)$ (with $u \cdot \geq R > d$ or $u > R \geq d$). The bond has a principal value of *$1* and yields after the first period its nominal value of *$1* and the interest *r*; *(R≡ 1+r).* Under these conditions the following two equations hold in the binomial model:

$$
\begin{aligned}
S(0) &= \pi_{1,0} \cdot u \cdot S(0) + \pi_{0,1} \cdot d \cdot S(0) \\
1 &= \pi_{1,0} \cdot R + \pi_{0,1} \cdot R
\end{aligned}
$$

Solving for the state prices $\pi_{1,0}$ and $\pi_{0,1}$, one gets:

$$
\begin{aligned}
\pi_{1,0} &= \frac{R-d}{(u-d)\cdot R} \\
\pi_{0,1} &= \frac{u-R}{(u-d)\cdot R}
\end{aligned}
$$

Thus, the value of a European call-option *C(0)* in *t=0* in the binomial model is given by:

$$C(0) = \pi_{1,0} \max[u \cdot S(0) - K, 0] + \pi_{0,1} \max[d \cdot S(0) - K, 0] \tag{10}$$

where *K* denotes the strike price of the option.

When a recent market transaction has not taken place, the fair value is calculated according to equation (10) in the following. The question arises how the fair value relates to the set of relevant option values in an incomplete market.

The first scenario is described by the fact that no price exists for a share option in an incomplete market. Incompleteness is specified according to assumption 1.

Statement 2 ***(Relation between fair value of a share option and its set of relevant values in a non-active market)*** *Assuming the existence of a financial market which is incomplete (3 states and 2 assets) and free of arbitrage in such a way that the relevant values of a share option are the set of values between an upper bound* MVA^{ub} *and a lower bound* MVA^{lb} *, then the fair value of a share option at t=0 determined by the binomial model is the upper or the lower bound of the set of relevant values:*

$$MVA^{lb}(0) = \text{Fair Value or } MVA^{ub}(0) = \text{Fair Value} \tag{11}$$

The statement is explained in the appendix and is illustrated in the following example. The price of a share at *t=0* is *\$100*. At *t=1* there are three possible stock prices, the price per share can be *\$155*, *\$100* and *\$55*. The risk free interest rate is *r=25%.* A share option is also traded; it has a strike price *K=\$100*. The fair value of the share option is determined by the use of the binomial model. According to equation (10) by combining the 'up-path', $u \cdot S(0)$, and the 'down-path', $d \cdot S(0)$, one gets a fair value of *\$30.80*.

The relevant values of the stock option are determined by solving the equations:

$$100 = 155 \cdot \pi_{1,0,0} + 100 \cdot \pi_{0,1,0} + 55 \cdot \pi_{0,0,1}$$
$$1 = 1.25 \cdot \pi_{1,0,0} + 1.25 \cdot \pi_{0,1,0} + 1.25 \cdot \pi_{0,0,1}$$

for $\pi_{1,0,0}$ and $\pi_{0,0,1}$:

$$\pi_{1,0,0} = \frac{56}{100} - \frac{45}{100} \cdot \pi_{0,1,0} \tag{12}$$

$$\pi_{0,0,1} = \frac{24}{100} - \frac{55}{100} \cdot \pi_{0,1,0} \tag{13}$$

Equations (12) and (13) together with the bounds $0 < \pi_{1,0,0} < 1$ and $0 < \pi_{0,0,1} < 1$ imply that:

$$0 < \pi_{0,1,0} < \frac{24}{55} \tag{14}$$

After inserting equation (13) with the bounds of the state price (14) in the valuation equation of the call option in a market without arbitrage opportunities

$$C(0) = 55 \cdot \pi_{1,0,0}$$

one gets the set of the relevant values of the stock option, which is equal to]$20, $30.80[. Thus it turns out, that one fair value is the upper bound of the set of the relevant values.

Furthermore, one also sees from the example that on the balance sheet the stock option is measured at a value ($30.80) which does not fulfil the underlying assumption of a financial market being free of arbitrage (assumption 1). Taking account of the relevant values]$20, $30.80[the stock option's value on the balance sheet suggests that the financial market is not free of arbitrage.

The term "fair value" is misleading. "Fair" implicates - as Lys (1996) pointed out - that the value is unbiased. It suggests an objective value in the sense that every object has only one value (valor intrinsecus) (see, for example, Engels (1962) and Toulmins (1961)). One unique fair value does generally not exist. This is readily seen by the management's possibility to choose between several valuation models. Here, it is shown that the fair value is not necessarily unique, even if the management sticks to one valuation model.

Management has the possibility to choose the information, which serves as input data for the binomial model.

Statement 3 ***(Fair Value and uniqueness)*** *Assuming the existence of a financial market which is incomplete (3 different states and 2 assets) and free of arbitrage in such a way that the relevant values of a share option are the set of values between an upper bound* MVA^{ub} *and a lower bound* MVA^{lb} *, then the fair value as determined by the binomial model is in general not unique in an incomplete market. Management has therefore generally discretion in determining the fair value.*

The statement is explained in the appendix and is illustrated in the following example. The data of the previous example is assumed. The fair value of the share option can be determined by combining the 'up-path', $u \cdot S(0)$, and the 'middle-path', $v \cdot S(0)$. According to equation (10) the fair value is in this case *$20*. The fair value is therefore the lower bound of the set of relevant values.

A management who (does not practise) practices conservative accounting will measure the asset with the fair value equal to the lower bound (upper bound).

The second scenario is described by the fact that a price for a share option exists in an incomplete market. According to equation (6) the market price is the relevant value. If the fair value is set equal to the market value, then the fair value is relevant. In this case IAS 39 provides a measurement concept, which is value-relevant. In non-active markets according to IAS 39 one can also use option pricing models to determine the fair value. If the fair value is calculated according to (10), it is not relevant. Because the market price, according to assumption 1, is located between the upper bound MVA^{ub} and the lower bound MVA^{lb} , it does not match with the fair value, which, according to (10), is equal to one of the bounds.

In a simple setting of an incomplete market, one can conclude for the relevance of the fair value:

- If a market price for a share option does not exist, then the set of values between an upper and a lower bound is value-relevant. The fair value is not value-relevant.
- If a market price for a share option exists, then this price is value-relevant. If the fair value is set equal to this price, it is value-relevant. Otherwise if the fair value is determined according to a valuation model, it is not relevant.

In the ’Exposure Draft of Proposed Amendments to IAS 39 Financial Instruments: Recognition and Measurement’ a three-tier fair value measurement hierarchy is proposed. In non-active markets the Exposure Draft differentiates between two cases: a recent market transaction exists or not. If a recent market transaction exists, the fair value is determined by reference to the market price of the recent transaction. If a recent market transaction does not exist, the fair value is determined by using a valuation model. The IASB simplified the proposed fair value measurement hierarchy. IAS 39 only requires that the fair value is determined on the basis of valuation models, including the use of recent market transactions.

The above analysis shows that the proposed measurement hierarchy of the Exposure Draft seems to be the better valuation concept. This valuation concept requires that prices are used whenever prices exists, whereas according to IAS 39 there is no necessity to set the fair value equal to the price in non-active markets. It is seen from the example that when prices exist and the fair value is set equal to prices, the fair value is relevant.

In the following this result is generalized for all financial instruments which are traded in incomplete markets and whose fair values are determined by models assuming complete markets.

Statement 4 ***(Relation between fair value of a financial instrument and its set of relevant values)*** *Given a market which is incomplete (3 states and 2 assets, one asset is a risk free bond) and free of arbitrage in such a way that the relevant values of a financial instrument are the set of values between an upper and a lower bound, then the fair value of a financial instrument determined by a model assuming a complete market (2 states and 2 assets) is equal to one of the bounds of the relevant values.*

5. CONCLUDING REMARKS

This paper addresses fundamental issues concerning the relation between the market value of equity and the fair value of financial derivatives according to IAS 39. It is shown that the fair value of a financial derivative is not necessarily relevant in a simple setting of a non-active market. If a model assuming an active market is used to determine the fair value in non-active markets, two consequences arise:

1. The fair value of a financial derivative is the value of a financial derivative in a fictitious market situation. Therefore the market value of equity at the balance sheet date reflects the firm's value in a fictive market situation.

2. The fair value is not unique, even if everybody uses the same valuation model. The company's management has flexibility in determining the fair value as through selecting the information underlying the valuation model.

Finally, the discussion reveals that prices are value-relevant in active and non-active markets.

APPENDIX

STATEMENT 1

$\pi_{1,0,0}$, $\pi_{0,1,0}$ and $\pi_{0,0,1}$ are defined as state securities, which pay *$1* in the *u*, *v* or *d* state and *$0* otherwise. The following equations hold for the price per share and the price of the bond in a setting where no arbitrage opportunities exist.

$$S(0) = \pi_{1,0,0} u \cdot S(0) + \pi_{0,1,0} v \cdot S(0) + \pi_{0,0,1} d \cdot S(0) \tag{16}$$

$$1 = \pi_{1,0,0} R + \pi_{0,1,0} R + \pi_{0,0,1} R \tag{17}$$

Solving the equations (16) and (17) leads to:

$$\pi_{1,0,0} = \frac{R-d}{(u-d)R} - \frac{v-d}{u-d}\pi_{0,1,0}$$
$$\pi_{0,0,1} = \frac{u-R}{(u-d)R} - \frac{u-v}{u-d}\pi_{0,1,0}$$

Without loss of generality a call option is assumed. Consider the first scenario ($u > v > R > d$) with the definition of $C_{1,0,0}$, $C_{0,1,0}$, $C_{0,0,1}$ as return of a call option in the *u*, *v* or *d* state. After inserting the bounds of $\pi_{0,1,0}$ in the pricing equation of an option:

$$C(0) = \pi_{1,0,0} C_{1,0,0} + \pi_{0,1,0} C_{0,1,0} + \pi_{0,0,1} C_{0,0,1}$$

it follows:

$$C^{ub}(0) = \frac{R-d}{(u-d)R} C_{1,0,0} + \frac{u-R}{(u-d)R} C_{0,0,1}$$
$$C^{lb}(0) = \frac{R-d}{(v-d)R} C_{0,1,0} + \frac{v-R}{(v-d)R} C_{0,0,1}$$

In this scenario the fair value can be determined by combining the *u*-state and the *d*-state respectively the *v*-state and the *d*-state. Then the fair value equals $C^{ub}(0)$ respectively $C^{lb}(0)$. The second case *(u > R > v > d)* and the third case (*u* > *R* = *v* > *d*) can be proven analogously.

STATEMENT 2

Without loss of generality a call option is assumed. If *v* ≠ *R* and *u* > *v* > *R* > *d* (*u* > *R* > *v* > *d*) management can determine the fair value by choosing *u·S(0)* and *d·S(0)*, respectively *v·S(0)* and *d·S(0)* (*u·S(0)* and *v·S(0)* respectively *u·S(0)* and *d·S(0)*), as input variables of the model. If the strike price *K* < *u·S(0)* (*K* < *v·S(0)*), then the fair value is one of two possible values.

If *v*=*R*, the fair value can be determined by combining the up-state path *u* and the down-state path *d*, respectively by combining the up-state path *u* (down-state path *d*) and the middle-path *v*. In the case *u·S(0)* > *v·S(0)* = *R·S(0)* > *d·S(0)* > *K* the fair value is unique, because:

$$\frac{R-d}{(u-d)R}\left[u \cdot S(0) - K\right] + \frac{u-R}{(u-d)R}\left[d \cdot S(0) - K\right] = \frac{1}{R}\left[R \cdot S(0) - K\right]$$

In all other cases the fair value is not unique.

STATEMENT 3

Statement three is analogous to statement 1 and can therefore be proven analogously.

NOTES

[1] The analysis is restricted to financial derivatives held for trading. According to IAS 39.46 (International Accounting Standard No. 39. paragraph 46) derivatives “that are linked to and must be settled by delivery of such unquoted equity instrument” … “shall be measured at cost”.

[2] IAS 39.9.

[3] Reporting the market values of financial instruments is nothing new from the historical perspective. Swenson & Buttross (1993) point out that in the U.S. banks reported the market values of financial

instruments in their financial statements before 1938. As the great depression led to a lot of bankruptcies in the banking sector, the banks had to shift from the report of market values to the report of historical costs in 1938 (see Swenson & Buttross (1993)).

[4] IAS 39 AG71 – AG73.

[5] IAS 39 AG74 – AG79.

[6] The definition of an "active market" according to IAS 36.5 and IAS 38.7 is different from the definition of an "active market" in IAS 39 AG 71.

[7] The description of an "active market" in IAS 36.5 and IAS 38.7 is also not helpful in defining an active market:

"An active market is a market where all the following conditions exist:

1. the items traded within the market are homogeneous;
2. willing buyers and sellers can normally be found at any time; and
3. prices are available to the public."

The definition replaces the term "active market" with the undetermined terms "willing buyers and sellers" which "can normally be found at any time".

[8] A survey of the results of the empirical value relevance studies is also given in Ryan (2002).

[9] The analysis of Barth (1994) hinges on fair values of securities which are voluntarily disclosed by banks. Therefore her study is not related to a special SFAS.

[10] The market value of equity has been determined as the product of the number of shares outstanding and the price per share at the balance sheet date.

The regression equation of Shimko (1999) hinges upon the residual income valuation model (see e.g. Ohlson (1995)).

[11] Barth & Landman (1995) state that if the objective of financial statements is to reflect information from the liquidation perspective, then exit value should be the focus of fair value accounting.

[12] Since 1988 the International Accounting Standards Committee (IASC) and the IASB has worked on a standard, which deals with the accounting for financial instruments. The first phase of that project was completed in 1995 when the IASC Board published IAS 32, Financial Instruments: Disclosure and Presentation. The second phase, dealing with measurement and recognition issues, was initiated by the Discussion Paper, Accounting for Financial Assets and Financial Liabilities.

[13] If the state price is greater than $1 at t=0, an arbitrage opportunity exits by selling the state security short. In this case a risk-free gain is realized, because one gets more than $1 for the asset at t=0 and will possibly have to pay $1 at the state security's maturity (at t=1). If the state price is smaller than $0 at t=0, then buying the state security leads to a risk-free gain. One receives possibly $1 at maturity and a positive amount of cash by purchase.

REFERENCES

[1] Barth, M. E. (1994). 'Fair Value Accounting: Evidence from Investment Securities and the Valuation of Banks', *The Accounting Review,* 69, January, pp. 1-25.

[2] Barth, M. E. & Landsman, W. R. (1995). 'Fundamental Issues Related to Using Fair Value Accounting for Financial Reporting', *Accounting Horizons*, December, pp. 97-107.

[3] Barth, M. E., Beaver, W. H. & Landsman, W. R. (1996). 'Value relevance of Banks' Fair Value Disclosures under SFAS No.107', *The Accounting Review*, 71, October, pp. 513-537.

[4] Beaver, W. H. (1998). *Financial Reporting – An Accounting Revolution*, 3rd edition, Upper Saddle River, New Jersey, Prentice-Hall.

[5] Black, F. & Scholes, M. (1973). 'The Pricing of Options and Corporate Liabilities', *Journal of Political Economy*, 81, May-June, pp. 637-654.

[6] Barrett, M. J., Beaver, W. H., Cooper, W. W., Milburn, J. A., Solomons, D. & Tweedie, D. P. (1991). American Accounting Association Committee on Accounting and Auditing Measurement 1998-1990, *Accounting Horizons*, 5, September, pp. 82-105.

[7] Cox, J. C., Ross, S. A. & Rubinstein, M. (1979). 'Option Pricing: A Simplified Approach', *Journal of Financial Economics*, 7, pp. 230-263.

[8] Eccher, A., Ramesh, K. & Thiagarajan, S. R. (1996). 'Fair Value Disclosures of Bank Holding Companies', *Journal of Accounting and Economics*, 22, August-December, pp. 79-117.

[9] Engels, W. (1962). *Betriebswirtschaftliche Bewertungslehre im Licht der Entscheidungstheorie*, Koeln, Westdeutscher Verlag.

[10] Holthausen, R. W. & Watts, R. L. (2001). 'The relevance of the value-relevance literature for

financial accounting standard setting', *Journal of Accounting and Economics*, 31, pp. 3-75.

[11] International Accounting Standards Committee (1997). *Accounting for Financial Assets and Financial Liabilities - A Discussion Paper issued for Comment by the Steering Committee on Financial Instruments*. London, International Accounting Standards Committee.

[12] International Accounting Standards Committee (1998). *Comment Letters – Volume 1-3.* London, International Accounting Standards Committee.

[13] International Accounting Standards Board (2004). *International Financial Reporting Standards 2004*, London, International Accounting Standards Board.

[14] International Accounting Standards Board (2002): *Exposure Draft of Proposed Amendments to IAS 32 Financial Instruments: Disclosure and Presentation; IAS 39 Financial Instruments: Recognition and Measurement*, London: International Accounting Standards Board.

[15] Joint Working Group of Standard Setters (2000). *Draft Standard and Basis for Conclusions, Financial Instruments and Similar Items*, London, International Accounting Standards Committee.

[16] Lys, T. (1996). 'Abandoning the transactions-based accounting model: Weighing the evidence.' *Journal of Accounting and Economics*, 22, pp. 55-175.

[17] Nelson, K. (1996). 'Fair Value Accounting for Commercial Banks: An Empirical Analysis of SFAS No. 107', *The Accounting Review*, 71, April, pp. 161-182.

[18] Ohlson, J. A. (1995). 'Earnings, Book values, and Dividends in Equity Valuation', *Contemporary Accounting Research*, 11, Spring, pp. 661-687.

[19] Petroni, K. & Wahlen, J. (1995). 'Fair Values of Equity and Debt Securities and Share Prices of Property Casualty Insurance Companies', *Journal of Risk and Insurance*, 62, December, pp. 719-737.

[20] Ryan, S. (2002). *Financial Instruments and Institutions: Accounting and Disclosure Rules*, Hoboken, John Wiley & Sons.

[21] Simko, P. (1999). 'Financial Instrument Fair Value and Nonfinancial Firms', *Journal of Accounting, Auditing and Finance*, 19, pp. 247-274.

[22] Skinner, D. (1996). 'Are disclosures about bank derivatives and employee stock options 'value-relevant'?', *Journal of Accounting and Economics*, 22, pp. 393-405.

[23] Swenson, D. W.; T. E. Buttross (1993). 'A Return to the Past: Disclosing Market Values of Financial Instruments, *Journal of Accountancy* 175, pp. 71-77.

[24] Toulmins, S. E. (1961). *An Examination of the Place of Reason in Ethics*. Cambridge, Cambridge University Press.

[25] Varian, H. R. (1987). 'The Arbitrage Principle in Financial Economics', *Economic Perspectives*, 1, pp. 55-72.

[26] Venkatachalam, M. (1996). 'Value-relevance of Banks' Derivatives Disclosures', *Journal of Accounting and Economics*, 22, pp. 327-355.

[27] Wampler, B. M. & Posey, C. L. (1998). 'Fair Value Disclosures and Share Prices: Evidence from Banking Industry', *Advances in Accounting*, 16, pp. 253-267.

TABLES/FIGURES

FIGURE 1:

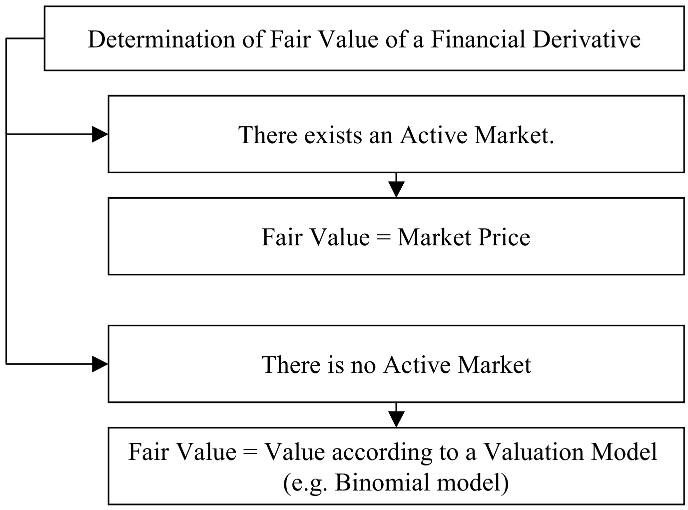

Figure 1

Determination of the Fair Value of Financial Derivatives according to IAS 39

FIGURE 2

Author	SFAS	Object	Time Period	Relevant Balance Sheet Positions	Irrelevant Balance Sheet Positions
Barth (1994)	-	Banks	1971 - 1990	Securities	No particulars
Barth/ Beaver/ Landsman (1996)	SFAS 107	Banks	1992	Loans	Off-Balance Sheet Items, Deposits, Long Term Debt
			1993	Loans, Securities	Off-Balance Sheet Items, Deposits, Long Term Debt
Eccher/ Ramesh/ Thiagarajan (1996)	SFAS 107	Banks	1992	Loans, Securities	Off-Balance Sheet Items, Deposits, Long Term Debt
			1993	Securities	Off-Balance Sheet Items, Deposits, Loans, Long Term Debt
Nelson (1996)	SFAS 107	Banks	1992 - 1993	-	Off-Balance Sheet Items, Deposits, Loans, Securities, Long Term Debt
Petroni/ Wahlen (1996)	SFAS 107	Property-liability Insurers	1985 - 1992	Equity securities, US Treasury securities	Some Debt Instruments
Simko (1999)	SFAS 107	Non-financial Firms	1992 - 1995	Financial Liabilities	Financial Assets, Derivatives
Venkatachalam (1996)	SFAS 119	Banks	1993 - 1994	Loans, Securities, Deposits, Debt, Derivatives	Some Off-Balance Sheet Items
Wampler/ Posey (1996)	SFAS 107	Banks	1992 - 1993	-	Loans

Figure 2

Survey of the Empirical Value Relevance Studies